

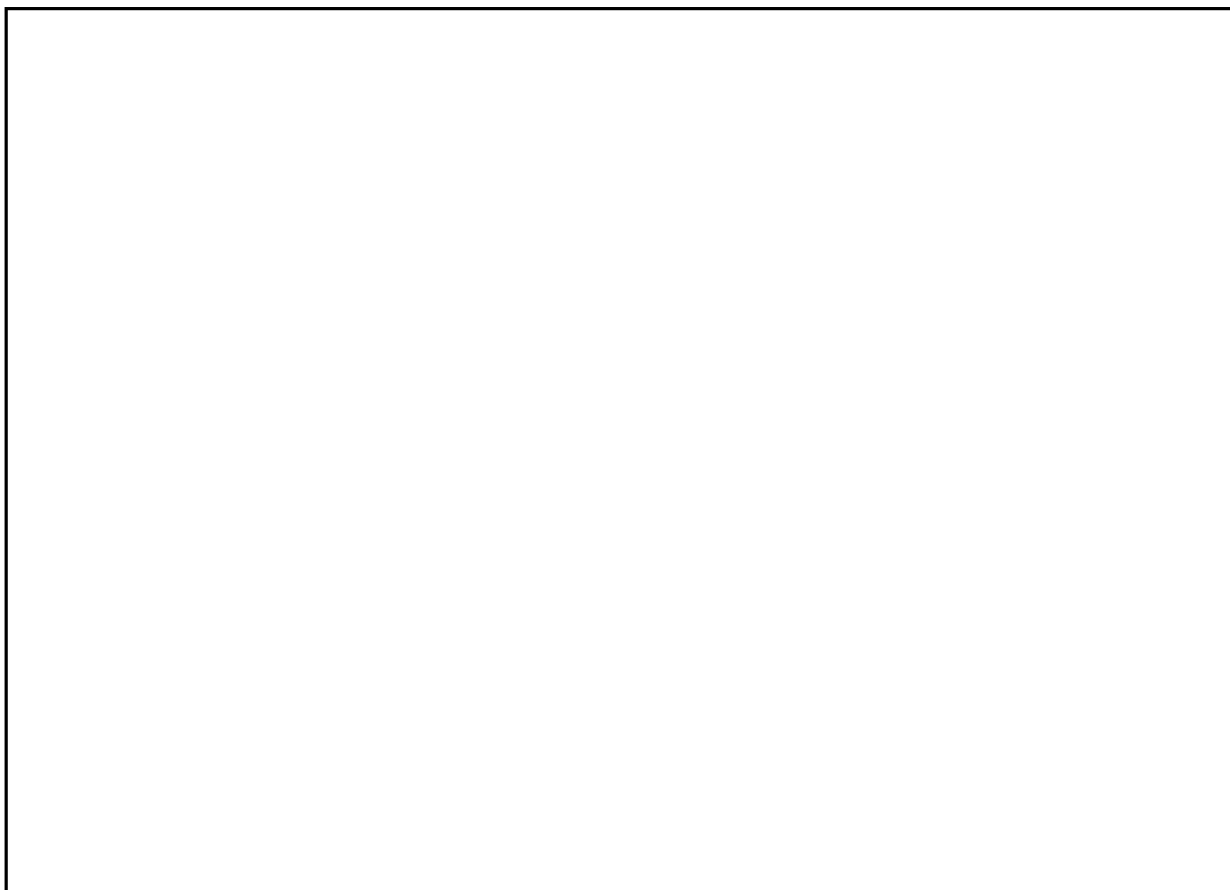
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APPLICATION OF INFORMATION SCIENCES TECHNIQUES
IN INTELLIGENCE PRODUCTION

1. A survey was made of production offices to ascertain the extent to which those involved in producing finished intelligence were utilizing the information sciences techniques, e.g., how much of an impact was training in the information sciences having on the product process. The following discussion sums up the situation on an office-by-office basis:

DDS&T Foreign Missile and Space Center

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capabilities on such problems.

3. Available information on the training of FMSAC analysts indicates that perhaps ten percent have had specific agency sponsored exposure to courses involving information science techniques exclusive of ADP. Two of the three FMSAC division chiefs interviewed believed there was a place for the application of new analytical concepts in their work, particularly if more emphasis in FMSAC were to be placed on longer term analysis as opposed to the rapid interpretation of current missile and space events. One of these indicated that his division was swamped with data and he simply had no time to experiment with new techniques, although he would like to do so. The second believed there was sufficient latitude, at least for more analyst training in the new techniques, but that their application would require a conscious change in management philosophy. The third, who deals with signals analysis, believes his problem is one of the development and application of sophisticated mathematics and bears little relation to the types of analysis discussed in this report.

DDI Office of Economic Research

4. The Chief of the Systems Development Staff of OER was queried concerning his views of the potential application and usefulness of the various new analytical techniques in production in OER. He indicated that his Office has run experiments using several of the new techniques from time to time and that while some showed promise, to date none had been introduced full time and he did not envision the wholesale replacement of present methods with the new. Specifically, he believed networking implied more specificity in problem isolation than it actually produced; that the Delphi method as he has seen it tried, was overly mechanical and did not produce insightful results; that Bayesian analysis offered some promise where there was a solid basis for conditional probability; and that linear programming was not very applicable to substantive intelligence. He felt that while a considerable number of OER analysts has had some exposure to the new techniques, on the whole the training had not been as convincing as it might be. In his opinion most such courses offer too much in too little time. He felt it would be better if they gave a thorough indoctrination in one of the new methods at one time and that full indoctrination in all the possibly relevant techniques would involve something like full time college training, and that this was a bar to widespread application of such methods. He did believe it would be worthwhile to expose many in the managerial levels to short (one week or so) courses in general familiarity with the various concepts, but that it would be impractical

to attempt full indoctrination because of time constraints.

5. He indicated that there were substantial numbers of OER analysts who had been trained in ADP and were using ADP in their jobs and that much more training needed to be done. He felt that the ultimate OER analyst would be one who combined familiarity with the new analytical techniques with a full substantive background.

DDI Office of Strategic Research

6. OSR is an office which is rapidly increasing its capability for quantitative analysis and expects to continue this trend. About one third of its production analysts have had ADP training and the aim is to give all analysts at least some such training. In addition, OSR currently is sending about a dozen analysts to full time university training in advanced economics and econometric modeling. The office also sponsors a wide range of evening university courses for its analysts in economics, math, ADP and operations research. In addition, it sends a relatively large porportion of analysts to OTR and to OCS for ADP instruction and has an arrangement with the Office of Research and Development whereby a math PhD works full time in OSR aiding in the solution of certain quantitative problems.

7. OSR anticipates a large increase in the flow of data which it must process over the next few years and is turning to modeling techniques and to the use of sampling theory as ways to cope with the problem. It now has a small number of qualified analysts for these techniques and is hiring analysts at the PhD level who are expert on organization theory and military decision making theory. An important part of OSR's work is expected to lie in the field of SALT verification and the office is attempting to accommodate to these needs by trying out and adopting techniques which will be of specific use.

8. OSR currently rates simulation techniques (with ADP support) as "very useful" in its operation. Content analysis (also computer based) is said to be useful in the analytical process, but not very convincing

when presented to the consumer of intelligence products. Bayesian applications are also said to be in the latter category -- it is hard to convince the non-technical consumer of the validity of Bayesian analysis. OSR believes it should continue to experiment with these new techniques and adopt those which suit its needs, but at the present time it feels that such techniques may not be as important as model simulation and rigorous management of the data base through ADP.

DDS&T Office of Scientific Intelligence

9. The deputy chiefs of the four substantive divisions of OSI were interviewed. The Defensive Systems Division reported that it is increasingly using ADP support and a number of computer assisted models for solving problems in areas including air defense, fighter aerodynamics, and anti-submarine warfare. About one half of the division's analysts had had at least some ADP training. The division sponsors full time PhD work in disciplines such as physics and engineering for qualified analysts and sends a steady stream of analysts to appropriate courses given by or sponsored by the Office of Training. In addition, the division sponsors orientation visits by production analysts to U.S. strategic military system sites, such as Kwajalein and White Sands. This division was unsure as to whether there would be a large increase in data for them to process as a result of new collection systems or the SALT agreements. With regard to the application of new analytical techniques, it appeared that the division had not had much success in the few attempts it had made to apply such techniques. One Delphi exercise, in particular, was cited as not being persuasive. The supervisor interviewed indicated it was his view that the advanced techniques had to be accompanied by conventional analytical experience, and, where possible, actual operational experience with weapons systems whose counterpart was being analyzed.

10. The Nuclear Energy Division indicated that most of its analysts had Bachelor's degrees at the outset and that many were

OTHER sponsored by OSI for after hours work on the Master's degree. In addition, some were sent to PhD courses and, in one case at least, post-doctoral training was given. It was stressed that all such training had to be in fields closely allied to the kind of analytical jobs being performed. In addition, the division sent many analysts on orientation trips to U.S. nuclear energy facilities -- diffusion plants, weapons manufacturing plants and weapons design centers. In the past year, of the ☐ professionals in the division, ☐ had been on such trips averaging 5 to 6 days each. This division is using a great deal of ADP in calculation work involving complex statistics. About half the analysts in the division use ADP regularly in their work. The division also has a contract under which analysts do computational work at the Livermore Laboratories facility because local computers do not have the required capacity. It was pointed out that NED analysts do the programming for this work. This division anticipated that it would be dealing with ever increasing quantities of data and that the day would come when raw information would be fed into computer data banks without having been seen by the production analysts and that some of its relevancy would thereby be lost, but that would be the only way by which the division could keep up with the flow of data. The division expressed concern that within a few years there would be large quantities of fissionable material unaccountable throughout the world and that many countries could thereby acquire a nuclear weapons capability. This was thought to be an area for

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future analysis by the division which would require considerable attention. With respect to the new analytical techniques, it was felt that the Bayesian approach, in its applications thus far, had been too subjective and that in most of NED's areas they didn't have enough of the kinds of data which lend themselves to use of the new techniques.

11. The Physical Science and Engineering Division said that it has a program by which about two of its ☐ professionals attend STATOTHR OSI sponsored PhD level university training. Such individuals are usually of the GS-12/13 level and among the better prospects for promotion to higher grades. This division also sponsored evening school training leading to the MS degree and regularly sent analysts to several shorter courses, both in CIA and outside. It was pointed out that outside training was becoming very expensive, with one recent two week course at UCLA costing \$650 plus per diem and travel. This division made the interesting comment that analysts recruited in the past few years had been very poorly trained in such skills as verbal presentation (writing) and spelling and that an inordinate amount of time had to be spent in training them to write intelligence in an acceptable manner. In addition, many seemed unwilling or unable to draw conclusions on problems on which they were working and apparently did not like to commit themselves to specific results of their analyses. PS&E Division did not expect a large increase in the quantities of data over the new few years and did not expect to adopt many of the newer analytical techniques. The Division has

for the past five years or so had a "Future Threats" Branch which has used various techniques to try to ascertain the likely future course of Soviet weapons development. The Delphi technique was used on one occasion to poll a large number of scientists regarding the most likely line the USSR would take in weapons R&D development. The division concluded that the technique was an interesting tool, but that it was hard to get participants who were sufficiently familiar with the state of Soviet weaponry to look confidently into the future. The division is currently working a Bayesian method experiment in conjunction with DIA and contractors from the [] STAT

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[] The division indicated that while many of its analysts had had some exposure to the new analytical methods (and on one occasion many were briefed at CIA by a [] consultant on such methods), many of the analysts could not see how such techniques were applicable to their jobs. STATOTHR

12. The Life Sciences Division, which has [] professionals, sponsors after hours training, PhD work, and other graduate level full time training at universities. All of its analysts were said to have some training in ADP assistance in analytical projects. The division felt its personnel had taken most of CIA's training courses which would be of use in the division's work. Two projects, STATOTHR

[] and other involving predictions concerning the spread of epidemics, used advanced analytical techniques. The first utilized Bayesian methods under which medical symptoms were systematically weighted, and the other used models constructed to systematically search the

possibilities for disease spread. The division did not foresee an early increase in the applicability of the new analytical devices and methods to their problems, but did expect to continue down the lines they were already investigating.

SUMMARY AND CONCLUSIONS

13. It is clear that CIA, in its Office of Training and at the sponsorship of production offices, devotes considerable attention to the indoctrination of analysts in the kinds of production work they will be doing. Furthermore, there is much opportunity for analysts, once they have been on the job, to take additional training in courses applicable to their work and in new methods of analysis. The training of analysts in ADP techniques and usage is particularly widespread and in many of the production offices ADP is used extensively. Use ranges from simple data storage and retrieval to very complex mathematical problem solving. It appears that such training and usage will continue to expand, partly because many production offices anticipate a much larger flow of data in the next few years.

14. There has been a relatively large exposure of analysts and managers to analytical techniques such as queuing theory, linear programming, Bayesian analysis, correlation and regression analysis, networking and systems analysis. Only in a relatively few offices, however, have these techniques been tried in more than an experimental way. As might be expected, those offices which deal with "hard" data have been more prone to experiment with the new techniques, but even

in most of such cases the results have not been sufficiently persuasive to cause broad adoption of such techniques. The reasons given are that:

- A. Analysts are not given deep enough training to be confident in their use;
- B. That the types of data in hand do not lend themselves to such manipulation;
- C. That there is an insufficiency of time and resources to do much experimentation;
- D. That consumers of intelligence would not understand analysis based on such techniques and;
- E. That in cases where such techniques have been tried there has not been an optimum mix of technical and substantive talent committed to the project.

15. Nevertheless, considering the anticipated growth in flow of data, it seems that some new processes, such as sampling and modeling will inevitably increase in usage, as will the use of computers, both in data processing and in complex mathematical problem solving. The areas of most experimentation and fastest adoption of new analytical techniques will be in those offices which deal with "hard" data. In offices which deal with "soft" information, i.e., political reporting, there appears to be little inclination to train personnel in new techniques, or to adopt such techniques. The gulf between traditional analysis by historian or political scientist on the one hand and quantification by esoteric analytical methods is simply too great to be easily bridged.

16. In either case, we seem to be at a point where most production offices appear to recognize the need to adopt better methods of analysis, but that they are not persuaded that the new methods indeed are better than the traditional ones. What therefore appears to be needed is a concentrated attempt to ascertain the general applicability of each of the new methods of analysis to the intelligence production problem, including political analysis. Such an effort would be in the nature of broad testing of whether the new methods are better than the old and should therefore be adopted. Until there is such a test, there will be no way of knowing how far and how fast the new methods should be applied, and the growth of their use will be tentative and piecemeal with little experience being passed from one office to another. Should the tests prove negative, much unnecessary training and experimentation might be avoided.